Sept. 30, 1969 C. BARTH 3,469,489

SYSTEM OF MOVABLE FRETS FOR STRINGED MUSICAL INSTRUMENT

Filed May 27, 1968

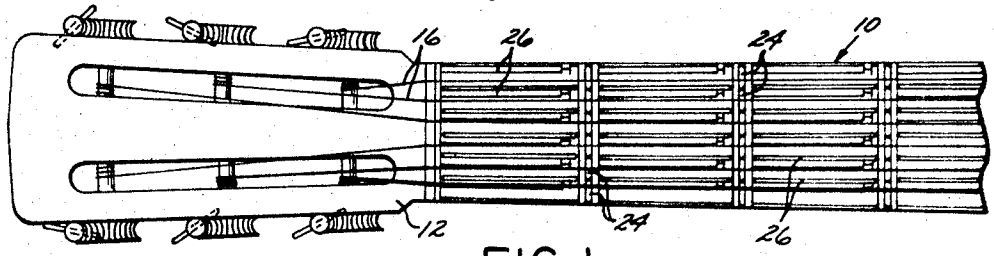


FIG. 1

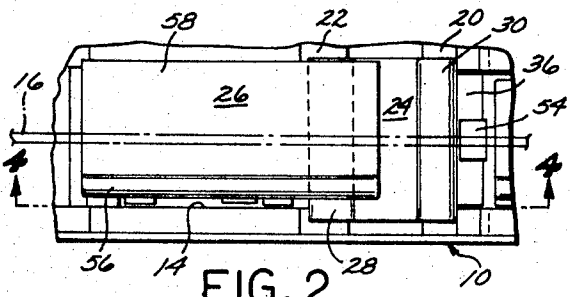


FIG. 2

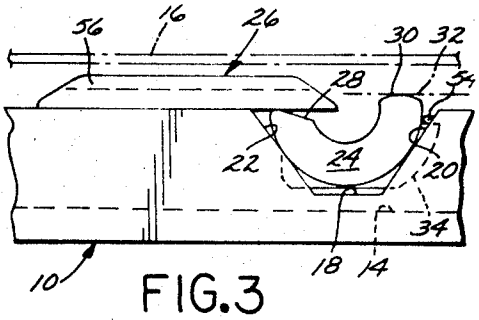


FIG. 3

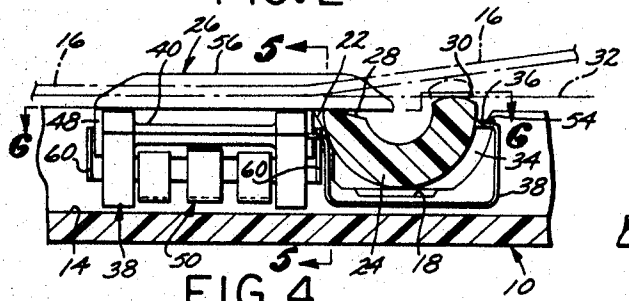


FIG. 4

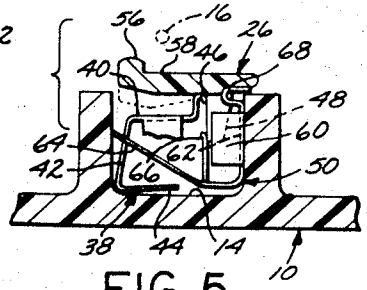


FIG. 5

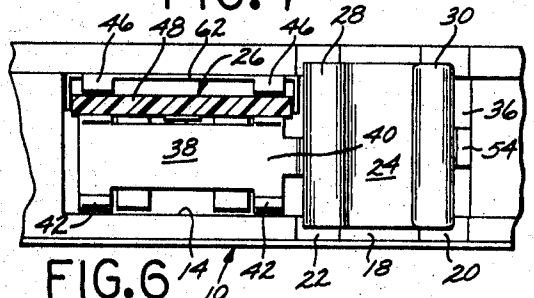


FIG. 6

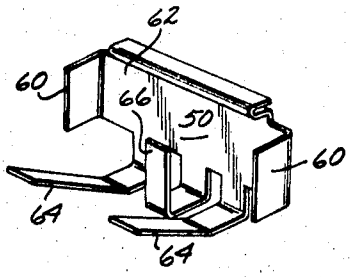


FIG. 7

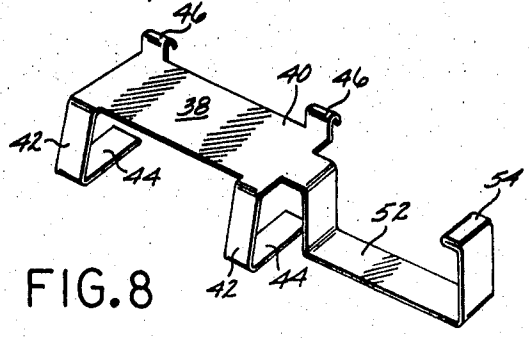


FIG. 8

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SYSTEM OF MOVABLE FRETS FOR STRINGED MUSICAL INSTRUMENT

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ABSTRACT OF THE DISCLOSURE

A system of movable frets for incorporation in the fingerboard of a stringed musical instrument, and in which each fret is independently movable toward its adjacent string by displacement of an actuator located adjacent the string and automatically operated by the playing finger of the musician on usual depression of the string toward the fret.

BACKGROUND OF THE INVENTION

Field of the invention

The invention relates to stringed instruments, and more particularly to fretted instruments in which the strings are pressed against the frets to control the note or chord produced when the strings are played.

Description of the prior art

In a conventional fretted instrument such as a Spanish guitar, the desired notes and chords are produced by first depressing a particular string or group of strings into engagement with the associated frets of the guitar fingerboard, and thereafter striking, plucking or otherwise setting into vibration the guitar strings. The contact between the frets and the strings must be firm and solid to avoid vibrational interaction and objectionable buzzing noises. This in turn requires strong finger pressure on the strings, which alone is a considerable challenge to a beginner or student of the instrument. However, the problem of developing and maintaining adequate finger pressure is compounded by the characteristic necessity of having to stretch several fingers between widely spaced frets in order to play certain chords.

For example, where several strings must be pressed against selected frets on a conventional guitar, the fingers employed are arranged on the strings as close to the selected frets as possible to thereby minimize the amount of finger pressure required for solid fret contact. However, the length of the player's fingers, distance between the selected frets, or need to crowd fingers into a small area often results in finger contact on one or more strings a significant distance from the fret to be employed. By the nature of the geometry in the fingerboard-to-string relationship, a depressed string engages the adjacent, unwanted fret first and it is then necessary to increase the finger pressure until the string bears firmly against the desired fret.

The increase in finger pressure to achieve good contact increases asymptotically as the point of finger contact moves farther from the desired fret. Good contact becomes unachievable at some point, varying with fret position, instrument, and player. This results from the increasing obstruction which the unwanted fret presents to finger depression.

The musician must therefore develop the technique of applying varying pressures to the strings, according to the location of the point of finger contact in the zone between the desired fret and the adjacent fret; he must develop the endurance to apply the required finger pressure for prolonged periods; and he must develop calluses on

his fingertips it withstand the otherwise painful bearing pressures occasioned when the point of finger contact is a significant distance from the selected fret.

Instances of bowed necks, a chronic problem in conventional instruments, result in increased finger pressures required for clear tones because bowing upsets the normal fingerboard-to-string geometry. Bowing is almost invariably in the direction encouraged by string tension, i.e., toward a hollow fingerboard, raising the strings away from the fingerboard. This has the effect of an increased taper of the string plane relative to the fret plane. The effective increased taper results in a need for an even greater depression of the string after contact with the unwanted fret to point of contact with the desired fret. If the bridge should be lowered to compensate for this, it will result in inadequate clearance and buzzing when frets in the upper register are employed.

Any discrepancy is one or more frets lying outside a flat plane will result in some degree of additional effort by the player. However, manufacture and/or maintenance of an instrument in which frets can be fixed in a perfect plane is beyond the current state of the art. Neck straightening mechanisms are often incorporated, but these devices can only work in the direction of reestablishing the optimum flat plane; they work against the neck as a unit and therefore cannot correct local out-of-plane conditions.

Stringed instruments of the prior art seem not to have been addressed to the foregoing problems. Those which employ movable frets apparently do so to achieve some special musical effect, as in U.S. Patent No. 2,489,657; or to simultaneously engage all strings with one fret, as in U.S. Patent No. 1,727,230; or to adjust the vibrational length of a string by some ancillary or added lever, button, key or the like not directly associated with the act of depressing the string for engagement with a fret, as in U.S. Patent No. 2,368,256.

SUMMARY OF THE INVENTION

The present invention provides a system of movable frets for stringed musical instruments, in which each fret is movable toward an associated string as that string is depressed to thereby reduce the amount of finger pressure required to provide firm engagement between the string and the fret.

The present system can be incorporated in the stringed instrument at the time of manufacture, and it can also be employed with existing stringed instruments by replacement of the instrument fingerboard with a fingerboard including the present system of movable frets. When fitted to the stringed instrument, the present system permits the musician to utilize normal playing techniques, without having to manipulate auxiliary devices during playing to achieve the desired reduction in required finger pressure. In the preferred embodiment there are no levers, buttons, keys, or the like which protrude outside of the conventional dimensional envelope of the instrument.

The system provides a plurality of frets arranged across the guitar neck and constituting a fret set comparable to the conventional fret, and a plurality of these sets are spaced along the length of the guitar neck at the same locations as the conventional frets.

The upper surfaces of the frets lie in a static fret plane located below the plane of the strings, and are selectively urged upwardly toward an associated string by means of an actuator. Preferably the actuator takes the form of an elongated element positioned closely adjacent a string and extending between a pair of longitudinally spaced frets. The upper surface of the actuator is preferably located below the string plane and the actuator is so located that when the musician depresses a string to effect engagement of the string with a particular fret, the actuator associated with that fret is automatically

depressed by the finger. The acuator is suitably coupled to the fret upper surface so that as the string and actuator are depressed, there is a corresponding upward movement of the fret upper surface, with firm engagement between the fret upper surface and the string occurring in a plane located above the static fret plane. Such engagement occurs with substantially the same finger pressure, regardless of the location of the point of engagement of the actuator by the player's finger. Moreover, it will be apparent that the amount of finger pressure is reduced because the selected fret is moved upwardly sufficiently that the associated string is engaged in a plane high enough above the static fret plane that string depression is not obstructed by the next adjacent fret. Consequently, the amount of finger pressure required to effect the desired string depression is substantially unchanged, regardless of what the proximity may be between the unwanted fret and the point of engagement of the player's finger with the actuator.

Summarizing the primary objects of the present invention, the system reduces the finger pressures required to play a fretted stringed instrument, reduces the variations in finger pressures required relative to variance in finger positions between frets, alleviates the greater finger pressure requirements normally occasioned by an instrument having a bowed neck, and permits finger placement farther away from the selected fret. The individual frets are each selectively movable to engage the associated string at a point which largely eliminates the possibility of an adjacent, unwanted fret acting as a barrier to proper seating of the string on the selected fret.

Other objects and features of the invention will become apparent from consideration of the following description taken in connection with the accompanying drawings.

BRIEF DESCRIPTION OF THE DRAWING

FIG. 1 is a top plan view of the neck of a Spanish guitar incorporating the system of the present invention;

FIG. 2 is an enlarged top plan view of a portion of the system of FIG. 1, illustrating a fret operative to engage an associated guitar string;

FIG. 3 is a side elevational view of the portion of the system that is shown in FIG. 2, the fret being illustrated in its normal position, in which it is out of engagement with the associated string;

FIG. 4 is a view taken along the line 4—4 of FIG. 2, and also illustrating in dotted outline the operative position of the fret in engagement with the associated string;

FIG. 5 is a view taken along the line 5—5 of FIG. 4;

FIG. 6 is a view taken along the line 6—6 of FIG. 4;

FIG. 7 is an enlarged perspective view of the actuator support bracket; and

FIG. 8 is an enlarged view of the spring for urging the actuator and the fret toward the positions illustrated in FIG. 3.

DESCRIPTION OF THE PREFERRED EMBODIMENT

Referring now to the drawings, there is illustrated a portion of a usual and conventional Spanish guitar which has been modified in accordance with the present invention. This modification consists in substitution of a fingerboard **10** in place of the usual fingerboard. The fingerboard **10** could thus be a replacement for the fingerboard of an existing guitar, or could be installed as part of the original guitar. Moreover, although the invention will be described in conjunction with a Spanish guitar, it will be apparent that the invention is applicable for use in conjunction with a variety of fretted instruments which are played by pressing the strings upon frets to thereby control the note or chord resulting when the depressed string is plucked or otherwise played.

The fingerboard **10** is preferably an integral element attachable by an adhesive or other suitable means to the upper surface of the guitar neck **12**. The fingerboard **10** includes a plurality of adjacent, elongated grooves or channels **14** corresponding in number with the number of strings **16** of the guitar, aligned therewith, and located directly beneath the strings **16**.

The fingerboard **10** also includes a plurality of transversely oriented, longitudinally spaced channels extending across the longitudinal channels **14**, and which are each characterized by a base **18** and a pair of opposed sloping or inclined abutments **20** and **22**. The transverse channels are shallower than the longitudinal channels **14** so that the bases **18** and abutments **20** and **22** of each transverse channel are discontinuous, providing a pair of side-by-side bases **18** and pairs of side-by-side abutments **20** and **22** on the opposite sides of each channel **14**.

At the intersection of each longitudinal channel **14** with one of the transverse channels there is located an arcuate fret **24** so that, for the six stringed Spanish guitar illustrated, there are six frets **24** extending transversely acros the guitar neck **12** to form a set which is generally equivalent to the conventional continuous fret of the usual Spanish guitar. These sets of frets **24** are longitudinally spaced along the neck of the guitar, as best illustrated in FIG. 1.

With each fret **24** there is associated an elongated, longitudinally oriented lever or actuator **26** generally aligned with the associated string **16** and subjacent channel **14**. As will be seen the actuator **26** extending between the adjacent pair of longitudinally spaced frets **24** is adapted for downward movement upon depression of the associated string **16**, and the downward movement of the actuator **26** initiates an upward, pivotal movement of the adjacent fret **24** so that the string **16** does not have to be pressed downwardly with the force formerly required in guitars of the prior art. That is, the guitar fingering constitutes a depression of the desired string **16** in combination with a simultaneous raising of the adjacent fret **24**. The particular mechanism by which the fret **24** is raised in response to depression of the actuator **26** will be described in detail later.

Each fret **24** is generally arcuate in configuration and includes an inclined, substantially flat lower end **28** and a generally rounded upper end **30**, the upper ends **30** of the frets **24** lying generally in a static fret plane **32** located below the plane of the strings **16**. As best viewed in FIGS. 2 and 4, the outer surface of each fret **24** is rounded or arcuate to form bearing surfaces at the ends of the fret for slidable movement on the abutments **20** and **22** during partial rotation of the fret **24**. The portion of the fret **24** between the rounded ends projects radially outwardly to define a central band **34** which extends more deeply into the associated channel **14**, with the edges or shoulders of the band **34** engaging the sides of the channel **14** to constrain the fret **24** against lateral movement.

The upper terminus of the band **34** forms a ledge **36** located adjacent the fret upper end **30**, and this ledge is engaged by a spring **38** which tends to maintain the fret in the normal position illustrated in FIG. 3. However, as will be seen, the spring **38** is biasable upwardly to permit partial rotation of the fret to the dotted position illustrated in FIG. 4.

More particularly, the bias means or fret spring **38** for each fret, as best viewed in FIGS. 4, 5 and 8, fits within its associated channel **14** and extends generally longitudinally of the channel. The spring **38** includes a flat, generally horizontal platform **40** which at one longitudinal edge includes a pair of depending legs **42** which terminate in horizontally disposed base portions **44** which rest upon the base or floor of the channel **14**. The opposite longitudinal edge of the platform **40** includes a pair of upwardly projecting spring sections **46** having reversely formed ends which engage the underside of the superjacent actuator **26**. The spring sections **46** also engage the confronting side of a depending positioning portion **48** which is integral with the actuator **26**.

With this arrangement, whenever the actuator **26** is depressed from the full line position to the dotted line position illustrated in FIG. 5, engagement between the underside of the actuator **26** and the spring sections **46** causes the spring sections **46** to be biased downwardly. The bias developed by such deformation tends to move the actuator upwardly to return it to the position illustrated in full line in FIG. 5.

The engagement of the spring sections **46** with the portion **48** of the actuator **26** also tends to constrain the actuator **26** from lateral movement toward the spring **38**. As will be seen, movement of the actuator **26** in the opposite lateral direction is constrained by engagement between the actuator **26** and a support bracket **50**.

The spring **38** includes a U-shaped longitudinal extension **52** integral with one end margin of the platform **40**, the free end of the extension **52** terminating in a reversely formed and backwardly projecting tab **54**. The tab **54** is the portion of the spring **38** which rests upon the ledge **36** of the fret **24** to bias it downwardly, as previously mentioned. The spring **38** therefore performs the dual function of biasing both the actuator **26** and the fret **24** to the full line position thereof illustrated in FIGS. 4 and 5.

In addition to the depending portion **48**, each actuator includes an integral upward portion which is generally L-shaped in configuration, including an upright finger portion **56** for engagement by the musician's fingers, and a horizontally oriented portion **58**, as best viewed in FIGS. 4 through 7. The depending portion **48** fits between a pair of longitudinally spaced end tabs **60** integral with the opposite ends of the support bracket **50**, and the bracket **50** together with the actuator portion **48** fits within the associated longitudinal channel **14** next to the spring **38**. As will be seen, the bracket **50** not only locates and retains the actuator **26** in position in the channel **14**, but also cooperates with the spring **38** to define a fulcrum or axis of pivotal movement for the actuator **26**.

The bracket end tabs **60** are integral with a vertically oriented bracket portion **62** which rests against the adjacent wall of the channel **14**. The lower margin of the portion **62** also integrally includes a pair of longitudinally spaced tongues **64** which extend downwardly toward the base of the channel **14**, transversely of the base, and then slope upwardly into engagement with the side of the channel **14** opposite the side against which the portion **62** rests. The resilient tongues **64** terminate in edges which tend to dig into and seat in the channel wall to maintain the support bracket **50** in position in the channel **14**. This permits the bracket **50** to be pressed into position within the channel **14** in a manner which makes inadvertent removal of the bracket **50** from the channel **14** improbable.

Also forming an integral part of the lower margin of the bracket portion **62** is a stop or element **66** which is located between the tongues **64** and also extends transversely. However, instead of engaging the opposite wall, the element **66** extends upwardly into engagement with a side of the actuator portion **48**, and thus serves as a stop to maintain the actuator **26** in the position illustrated in FIG. 5. In effect, the element **66** resiliently opposes the biasing action of the spring section **46**, which tends to pivot the actuator in a clockwise direction.

As best viewed in FIG. 5, the upper margin of the bracket portion **62** is bent inwardly of the channel **14** and seats within a longitudinal groove **68** provided in the side of the actuator **26**. The upper margin of the portion **62** is further bent or deformed outwardly for engagement with the underside of the horizontal portion **58** of the actuator, thereby supporting the actuator against downward movement in the area and providing a fulcrum about which pivotal movement of the actuator can occur.

Consequently, depression of the actuator portion **56** by the musician pivots the actuator downwardly to the dotted position illustrated in FIG. 5, the pivotal movement taking place generally about an axis extending along the centerline of the longitudinal groove **68** in the actuator **26**. Thus, the rotation takes place about the rounded surface of the reversely formed upper margin of the bracket **50**.

Summarizing the interrelation of each set of fret **24**, actuator **26**, spring **38**, and bracket **50**, the actuator **26** is oriented and supported in position by the bracket **50**, which constrains the actuator **26** against longitudinal movement, transverse movement, downward and upward movement in the area of the upper margin of the bracket, and upward movement relative to the upper extremity of the bracket **50**.

The spring **38** biases the actuator finger portion **56** to the full line position illustrated in FIG. 5, also biases the fret **24** downwardly for clockwise rotational movement to the full line position illustrated in FIG. 4, and constrains the actuator **26** against transverse movement. Moreover, since the lower end **28** of each fret **24** underlies its associated actuator **26**, the spring **38** and the actuator cooperate to maintain the fret **24** in position within its channel **14**.

The finger portion **56** of the actuator **26** is so located that it is depressed by the musician's finger when the finger depresses the adjacent string **16**. Such depression of the string **16**, and rising of the fret **24** occasioned by the movement of the actuator **26**, results in engagement between the fret and the string in a plane which is located above the static fret plane **32**. The point of engagement thus brings the string away from interference with the adjacent fret **24**.

The musical instrument is played by pressing the strings **16** downwardly in the usual manner, the act of pressing a finger against a particular string **16** serving not only to depress the string but also to engage and depress the associated actuator **26**. The continued depression of the string and the actuator **26** pivots the actuator generally about the fulcrum provided by the upper margins of the support bracket **50**, the actuator moving downwardly against the bias of the spring **38**.

Depression of the actuator **26** causes it to rotate the fret **24** upwardly against the tab **54** of the associated spring **38**. The upwardly moving upper end **30** of the fret **24** meets the downwardly moving string **16** to effect the desired fretting. This occurs prior to the time that the string **16** is depressed to the point of engagement with the next adjacent or unwanted fret **24**.

When the player raises his finger from the string **16**, the bias of the spring **38** returns the fret **24** and the actuator **26** to the positions illustrated in full line in FIG. 4.

It is to be understood that the bias means **38** described above is merely exemplary and that the present invention comprehends other means for urging the components to their normal positions illustrated in full lines. Moreover, other means could be used to transmit movement of the actuator to the fret, it being important primarily that the interconnection or coupling be sufficiently solid that objectionable buzzing and rattling are eliminated.

I claim:

1. In a musical instrument having a tensioned string, the improvement comprising:

a fret movable toward and away from said string; and an actuator adjacent said fret and movable by the playing finger of the musician upon depression by the finger of that portion of said string adjacent said fret, said actuator being operative upon such movement to effect movement of said fret toward said string for engagement therewith.

2. The improvement of claim **1** and further including a bias means tending to urge said fret away from said string.

3. The improvement of claim **1** and further including a bias means tending to urge said actuator toward said string.

4. The improvement of claim 1 and including fingerboard means defining a fret receptacle below said string and having a pair of abutments engaged by said fret, said fret being rotatable upon said abutments upon engagement by said actuator whereby a portion of said fret is movable upwardly toward said string.

5. The improvement of claim 1 and including at least a pair of said frets spaced along the length of said string, and wherein said actuator is located below and generally aligned with said string, and extends between said frets for engagement by the musician's fingers anywhere in the intervening space between said frets.

6. The improvement of claim 1 wherein said actuator is elongated along the longitudinal axis of said string; and including a support bracket on edge of said actuator for pivotal movement of said actuator generally about said edge.

7. The improvement of claim 1 wherein said musical instrument includes a plurality of said tensioned strings, wherein said improvement includes a plurality of groups of said frets and actuators spaced along the length of said

strings, and wherein each of said groups includes a plurality of frets and actuators arranged beneath and transversely of said strings, respectively.

8. The improvement of claim 7 wherein the structure of said improvement lies wholly beneath said strings.

9. The improvement of claim 7 wherein said musical instrument is a Spanish guitar and the structure of said improvement lies wholly within the dimensional envelope of said guitar.

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PO-1050
(5/69)

UNITED STATES PATENT OFFICE
CERTIFICATE OF CORRECTION

Patent No. 3,469,489 Dated September 30, 1969

Inventor(s) CARL BARTH

It is certified that error appears in the above-identified patent and that said Letters Patent are hereby corrected as shown below:

Column 4, line 19, delete "acros" and insert --across--. Column 4, line 45, delete "2" and insert --3--. Column 5, line 15, delete "U-shaped" and insert --U-shape--. Column 5, line 2: delete "position" and insert --positions--.

SIGNED AND
SEALED
JAN 27 1970

(SEAL)
Attest:

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Attesting Officer

WILLIAM E. SCHUYLER, JR.
Commissioner of Patents